What is claimed is:

1. A method for providing calibrated geometric data from a three dimensional measurement system, the method comprising:

providing a reference object having a predetermined geometric structure;

providing reference object geometric structure data in a first coordinate frame, wherein the reference object geometric structure data corresponds to the predetermined geometric structure;

providing a three dimensional measurement system comprising:

a measurement element that measures geometric data in a second coordinate frame from the reference object and from a target object; and

a motion system that provides relative motion between the reference object and the measurement element, wherein the relative motion occurs in a third coordinate frame, wherein the three dimensional measurement system provides motion data in the third coordinate frame corresponding to the relative motion;

acquiring a geometric data set comprising the measured geometric data from the reference object by the measurement element as a result of the relative motion provided by the motion system, wherein the geometric data set further comprises the motion data;

determining a first transformational relationship between the second coordinate frame and the third coordinate frame, wherein the first transformational relationship is determined using the measured geometric data and the motion data contained within the geometric data set, and using the reference object geometric structure data; and

providing calibrated geometric data in a single coordinate frame from the target object by using the first transformational relationship.

2. The method of claim 1, further determining a second transformational relationship between the first coordinate frame and the third coordinate frame, wherein the first and second transformational relationships are both determined using the measured geometric data and the motion data contained within the geometric data set, and using the reference object geometric structure data.

3. The method of claim 2, wherein the first and second transformational relationships are iteratively determined in an alternating fashion.

4. The method of claim 1, wherein the calibrated geometric data is provided in the third coordinate frame by using the first transformational relationship to transform the measured geometric data within the geometric data set into transformed geometric data residing in the third coordinate frame, and then subsequently transforming the transformed geometric data using the motion data within the geometric data set to obtain the calibrated geometric data in the third coordinate frame.

5. The method of claim 2, wherein the calibrated geometric data is provided in the third coordinate frame by using the first transformational relationship to transform the measured geometric data within the geometric data set into transformed geometric data residing in the third coordinate frame, and then subsequently transforming the transformed geometric data using the motion data within the geometric data set to obtain the calibrated geometric data in the third coordinate frame.

6. The method of claim 1, wherein the measurement element comprises a laser scanner.

7. The method of claim 1, wherein the measurement element provides only substantially two dimensional measured geometric data.

8. The method of claim 1, wherein the motion system comprises a linear translation stage.

9. The method of claim 1, wherein the motion system comprises a rotary motion stage.

10. The method of claim 1, wherein the measurement element is rigidly attached to a movable portion of the motion system.

11. The method of claim 1, wherein the reference object is rigidly attached to a movable portion of the motion system.

12. The method of claim 1, wherein the reference object is in a static pose relative to the third coordinate frame.

13. The method of claim 1, wherein the predetermined geometric structure includes substantially planar facets.

14. The method of claim 1, wherein the predetermined geometric structure includes at least one pyramid shaped element.

15. The method of claim 1, wherein the predetermined geometric structure includes at least one truncated pyramid shaped element.

16. The method of claim 1, wherein the predetermined geometric structure includes elements forming a step gauge.

17. The method of claim 1, wherein the predetermined geometric structure includes

elements forming a step gauge, wherein the elements forming the step gauge comprise substantially parallel facets which are substantially planar.

18. The method of claim 1, wherein the predetermined geometric structure includes at least one substantially planar facet which is oriented at substantially 45 degrees with respect to at least one adjacent substantially planar facet.

19. The method of claim 1, wherein the predetermined geometric structure includes at least one substantially planar facet which is oriented at substantially 90 degrees with respect to at least one adjacent substantially planar facet.

20. The method of claim 1, wherein the measurement element provides three dimensional measured geometric data.

21. A method for providing calibrated geometric data from a three dimensional measurement system, the method comprising:

providing a reference object having a predetermined geometric structure;

providing reference object geometric structure data in a first coordinate frame, wherein the reference object geometric structure data corresponds to the predetermined geometric structure;

providing a three dimensional measurement system comprising:

a measurement element that measures geometric data in a second coordinate frame from the reference object and from a target object;

a first support system that supports the measurement element, wherein the first support system resides within a third coordinate frame, wherein the first support system is capable of supporting the measurement element in at least a first element position and a second element position; and

a second support system that supports the reference object, wherein the second support system resides within a fourth coordinate frame, wherein the second support system is capable of supporting the reference object in at least a first object position and a second object position;

wherein a first relative motion occurs between the measurement element and the reference object, wherein the three dimensional measurement system provides first motion data corresponding to the first relative motion, wherein the first motion data includes either or both first position data in the third coordinate frame from the first support system and first position data in the fourth coordinate frame from the second support system; and

wherein a second relative motion occurs between the measurement element and the reference object, wherein the three dimensional measurement system provides second motion data corresponding to the second relative motion, wherein the second motion data includes either or both second position data in the third coordinate frame from the first support system and second position data in the fourth coordinate frame from the second support system;

acquiring a first geometric data set comprising first measured geometric data from the reference object by the measurement element as a result of the first relative motion, wherein the first geometric data set further comprises the first motion data;

acquiring a second geometric data set comprising second measured geometric data from the reference object by the measurement element as a result of the second relative motion, wherein the second geometric data set further comprises the second motion data;

determining both a first transformational relationship between the second coordinate frame and the third coordinate frame, and a second transformational relationship between the first coordinate frame and the third coordinate frame, wherein both the first transformational relationship and the second transformational relationship are determined using the first measured geometric data and the first motion data contained within the first geometric data set, and using the reference object geometric structure data;

determining both a third transformational relationship between the second coordinate frame and the third coordinate frame, and a fourth transformational relationship between the first coordinate frame and the third coordinate frame, wherein both the third transformational relationship and the fourth transformational relationship are determined using the second measured geometric data and the second motion data contained within the second geometric data set, and using the reference object geometric structure data;

determining a fifth transformational relationship between the third coordinate frame and the fourth coordinate frame, wherein the fifth transformational relationship is determined using the second transformational relationship and the fourth transformational relationship; and

providing calibrated geometric data in a single coordinate frame from the target object by using the fifth transformational relationship and using either or both of the first transformational relationship and the third transformational relationship.

22. The method of claim 21, wherein the first and second transformational relationships are iteratively determined in an alternating fashion, and the third and fourth transformational relationships are iteratively determined in an alternating fashion.

23. The method of claim 21, wherein a third relative motion occurs between the measurement element and the target object, wherein third measured geometric data is acquired from the target object by the measurement element as a result of the third relative motion, wherein the three dimensional measurement system provides third motion data corresponding to the third relative motion, wherein the third motion data includes either or both third position data in the third coordinate frame from the first support system and third position data in the fourth coordinate frame from the second support system, wherein the three dimensional measurement system provides calibrated geometric data within the fourth coordinate frame by using either or both of the first transformational relationship and the third transformational relationship to transform the third measured geometric data into transformed geometric data residing in the third coordinate

frame, and then subsequently transforming the transformed geometric data using the third motion data to obtain further transformed geometric data within the third coordinate frame, and then subsequently using the fifth transformational relationship to transform the further transformed geometric data from the third coordinate frame into the fourth coordinate frame to obtain yet further transformed geometric data, and then subsequently transforming the yet further transformed geometric data using the third motion data.

24. The method of claim 21, wherein the measurement element comprises a laser scanner.

25. The method of claim 21, wherein the measurement element provides only substantially two dimensional measured geometric data.

26. The method of claim 21, wherein the first support system comprises a linear translation stage.

27. The method of claim 21, wherein the second support system comprises a linear translation stage.

28. The method of claim 21, wherein the first support system comprises a rotary motion stage.

29. The method of claim 21, wherein the second support system comprises a rotary motion stage.

30. The method of claim 26, wherein the measurement element is rigidly attached to a movable portion of the first support system.

31. The method of claim 29, wherein the reference object is rigidly attached to a movable portion of the second support system.

32. The method of claim 21, wherein the reference object is in a first static pose relative to the third coordinate frame during the acquiring of the first geometric data set, and wherein the reference object is in a second static pose relative to the third coordinate frame during the acquiring of the second geometric data set.

33. The method of claim 21, wherein the predetermined geometric structure includes substantially planar facets.

34. The method of claim 21, wherein the predetermined geometric structure includes at least one pyramid shaped element.

35. The method of claim 21, wherein the predetermined geometric structure includes at least one truncated pyramid shaped element.

36. The method of claim 21, wherein the predetermined geometric structure includes elements forming a step gauge.

37. The method of claim 21, wherein the predetermined geometric structure includes elements forming a step gauge, wherein the elements forming the step gauge comprise substantially parallel facets which are substantially planar.

38. The method of claim 21, wherein the predetermined geometric structure includes at least one substantially planar facet which is oriented at substantially 45 degrees with respect to at least one adjacent substantially planar facet.

39. The method of claim 21, wherein the predetermined geometric structure includes at least one substantially planar facet which is oriented at substantially 90 degrees with respect to at least one adjacent substantially planar facet.

40. The method of claim 21, wherein the measurement element provides three dimensional measured geometric data.

41. The method of claim 21, wherein the providing of the calibrated geometric data in the single coordinate frame from the target object uses the fifth transformational relationship and uses an average of the first transformational relationship and the third transformational relationship.